16. (New) The power amplifier module according to claim 6,

wherein the control circuit includes:

a circuit that converts the input control voltage into current;

a circuit that generates a reference voltage from the current into which the input control voltage has been converted and sets a gradient of voltage that changes in proportion to the input control voltage; and

a circuit that converts the voltage into the idling current that changes exponentially.

## REMARKS

Applicants respectfully request favorable reconsideration of this application, as amended.

Claims 5 and 6, which were indicated as being allowable, have been rewritten in independent form. Claims 11 and 12, which recite similar features, have been retained in dependent form. The remaining claims have been amended to delete the "for" type functional recitations and

to improve overall clarity. New dependent Claims 15 and 16 have been added.

Independent Claim 1 stands rejected under 35 U.S.C. § 102(e) as being anticipated by Ruth et al. (Ruth).

Without acceding to the rejection, Claim 1 has been amended more particularly to recite that the control circuit makes the idling current of the amplifier behave so as to follow an exponential function of the input control voltage. See, for example, the paragraph bridging pages 15 and 16 and the paragraph bridging pages 17 and 18 of the specification.

Ruth discloses a control circuit for controlling bias current of a variable gain amplifier. The control circuit includes a V/I converter 201, I/V converter 202 to develop a reference voltage, and V/I converter 204 to convert the reference voltage to a bias current for biasing amplifier 309. The I/V converter 204 is configured with a differential amplifier to generate control current that maps to a hyperbolic tangent (tanh) function. The control current to be applied to the amplifier 309 thus follows the tanh function of input voltage. Although the tanh function is based on an exponential function, it is not an exponential function itself.

On the other hand, in the invention as set forth in Claim 1, an idling current following an exponential function is supplied to an amplifier and no differential amplifier configuration is required -- for example, in V/I converter 354 or current supply circuit 355. Indeed, these circuits may simply be configured to have transistors without any differential amplifier configuration. The present invention is thus quite different from Ruth with regard to the control current output from the final stage of the bias circuit and also allows for a simple construction thereof.

Accordingly, Claim 1 distinguishes patentably from Ruth. The rejection under § 102(e) should therefore be withdrawn, and Claim 1 should now be allowed.

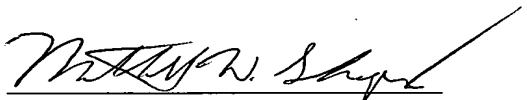
The dependent claims are, of course, allowable for at least the same reasons as Claim 1.

An early Notice of Allowance is respectfully solicited.

The Commissioner is hereby authorized to charge to Deposit Account No. 50-1165 any fees under 37 C.F.R. §§ 1.16 and 1.17 that may be required by this paper and to credit any overpayment to that Account. If any extension of time is required in connection with the filing of this

paper and has not been requested separately, such extension is hereby requested.

Respectfully submitted,

By: 
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Marked-up copy of Claims -- 09/962,182

1. (Amended) A power amplifier module comprising:

an amplifier; and

a control circuit [for supplying] that supplies the amplifier with an idling current that controls the output power of the amplifier,

wherein the control circuit receives an input control voltage and makes the idling current behave so as to [exponentially change, relative to] follow an exponential function of the input control voltage.

2. (Amended) The power amplifier module according to claim 1, wherein the control circuit [including] includes:

a circuit [for converting] that converts the input control voltage into current;

a circuit [for generating] that generates a reference voltage from the current into which the input control voltage has been converted and [setting] sets a gradient of voltage that changes in proportion to the input control voltage; and

a circuit [for converting] that converts the voltage into [the idling] current that changes exponentially relative to the input control voltage.

3. (Amended) The power amplifier module according to claim 1, wherein the amplifier is a complex comprising a plurality of stages of amplifiers connected in tandem, and wherein the control circuit is a complex comprising a plurality of circuits that receive the control input voltage in common and [separately] supply [the] respective idling [current] currents behaving as aforesaid to [one of] the plurality of stages of amplifiers.

4. (Amended) The power amplifier module according to claim 3, wherein a common circuit is formed, comprising [the] a circuit [for converting] that converts the input control voltage into current, [the] a circuit [for generating] that generates a reference voltage from the current into which the input control voltage has been converted and [setting] sets a gradient of voltage that changes in proportion to the input control voltage, and [the] a circuit [for converting] that converts the voltage

into [the idling] current that changes exponentially relative to the input control voltage, and

wherein a plurality of circuits [are provided for supplying] connected to said common circuit supply the respective idling [current] currents to the plurality of stages of amplifiers [such that each circuit serves each stage of amplifier with the idling current] based on the current that changes exponentially relative to the input control voltage.

5. (Amended) [The] A power amplifier module [according to claim 1,] comprising:

an amplifier; and

a control circuit that supplies the amplifier with an idling current that controls the output power of the amplifier;

wherein the control circuit receives an input control voltage and makes the idling current behave so as to exponentially change, relative to the input control voltage,

wherein the amplifier is fabricated with GaAsHBTs packaged on a semiconductor integrated circuit including a pair of an input transistor and an output transistor, the

input transistor carrying the idling current and forming a current mirror circuit in conjunction with the output transistor, and

wherein the control circuit is fabricated with Si transistors or GaAsHBTs packaged on a semiconductor integrated circuit.

6. (Amended) [The] A power amplifier module [according to claim 1,] comprising:

an amplifier; and

a control circuit that supplies the amplifier with an idling current that controls the output power of the amplifier,

wherein the control circuit receives an input control voltage and makes the idling current behave so as to exponentially change, relative to the input control voltage,

wherein the amplifier is fabricated with SiGeHBTs or Si bipolar transistors packaged on a semiconductor integrated circuit including a pair of an input transistor and an output transistor, the input transistor carrying the idling current and forming a current mirror circuit in conjunction with the output transistor, and

wherein the control circuit is fabricated with SiGeHBTs or Si bipolar transistors packaged on a semiconductor integrated circuit.

7. (Amended) The power amplifier module according to claim 1,

wherein the power amplifier module further includes a circuit [for limiting] that limits the idling current once the input control voltage has reached a predetermined level.

8. (Amended) The power amplifier module according to claim 1,

wherein the power amplifier module further includes a circuit by which [the] a temperature characteristic of the idling current can be set optionally.

9. (Amended) The power amplifier module according to claim 2,

wherein the amplifier is a complex comprising a plurality of stages of amplifiers connected in tandem, and

wherein the control circuit is a complex comprising a plurality of circuits that receive the control input

voltage in common and [separately] supply [the] respective idling [current] currents behaving as aforesaid to [one of] the plurality of stages of amplifiers.

10. (Amended) The power amplifier module according to claim 9, wherein a common circuit is formed, comprising the circuit [for converting] that converts the input control voltage into current, the circuit [for generating] that generates a reference voltage from the current into which the input control voltage has been converted and [setting] sets a gradient of voltage that changes in proportion to the input control voltage, and the circuit [for converting] that converts the voltage into the [idling] current that changes exponentially relative to the input control voltage,

wherein a plurality of circuits [are provided for supplying] connected to said common circuit supply the respective idling [current] currents to the plurality of stages of amplifiers [such that each circuit serves each stage of amplifier with the idling current] based on the current that changes exponentially relative to the input control voltage.

13. (Amended) The power amplifier module according to claim 3, wherein the power amplifier module further includes a circuit [for limiting] that limits the idling current once the input control voltage has reached a predetermined level.